the auger from boring into the ground, and also supporting the weight of the contained snow when the tube is withdrawn. The auger may be made by attaching a circular piece of 16-gauge iron to a wood handle with corner braces, then cutting on the diameter from opposite sides to the handle, and finally bending the edges of the cut to the desired shape. The snow sample may then be emptied into a light-weight receptacle—a 5-gallon oil can serves well—and weighed. Spring balances sold under the trade name "Dairy Scales," which are graduated in pounds and tenths on a dial, and have a capacity of 24 pounds, are suitable for this purpose and may be purchased almost anywhere. When the matted upper layer of snow is of considerable depth, as occurs under the bright sunshine of March and April, it is necessary to take out a few inches at a time, and reinsert the tube in the same hole until the granular layer is reached. The tough upper-layer snow will stick in the tube so that it may be removed without the support of the auger. If not taken out a little at a time it will clog even the large tube. The observer will learn by practice how best to meet this condition, although to pass from the tough upper layer to the dry granular snow remains the weak point in the problem of bounding a section of the snow layer.

The net weight of the sample in pounds gives the water equivalent in inches, but since density measurements must be made at right angles to the ground to prevent the escape of snow through the lower end of the tube when the auger is screwed down, it is best to compute the density from the weight and depth, and apply the factor thus determined to the vertical scale readings. Since the measurements used in surveys are horizontal, it is best to use the vertical values. For example, if the depth at right angles to the ground is 26 inches, and the weight of the sample in the 5.94-inch tube is 5.2 pounds, then the density is $5.2 \div 26 = 20$ per cent; and if the vertical depth as read from the snow scale is 30 inches, then the water equivalent of the snow layer is 20 per cent of 30 inches, or 6 inches. This value, multiplied by the area of the slope as scaled from a map, will give the cubic water content of the slope.

The density measurements should be made at some distance from the scale so that conditions at that point may not be disturbed. It is well to select the place for the density measurements before the first snow, clear the ground, and stretch a wire across for a marker. A rag fastened to the wire with a clothespin serves to mark the place at which the snow has been disturbed, so that subsequent measurements may be made at a different place even though a new snow may have fallen.

The methods and apparatus here described are the result of actual experience with snow up to 5 feet depth. The appliances can be readily secured almost anywhere, and while the values found by their use are far from refined, yet in the region where they have been used they furnish a reliable working basis for both comparative and quantitative measurements. The weight of the large tube unfortunately renders it difficult to carry about, but the cost is small enough to permit an equipment at each measuring station. In the hands of expert toolmakers, the appliances could no doubt be greatly refined.

INTERESTING SOLAR HALO.

By FREDERICK SLOCUM, Assistant at the Yerkes Observatory, Williams Bay, Wis.

Between noon and 1 p. m. (central standard time) May 19, 1910, solar halos were observed and also streaks and patches of brilliant colors, some resembling fragments of a rainbow and others isolated patches of approximately monochromatic colors, rose, pink, green, blue, etc., while some showed iridescent or iris effects. These appeared in the south at an altitude of 15° to 20°.

At the time, great masses of cumulus clouds were slowly drifting from the west. Back of the cumulus were brush-like formations of cirrus. The colors were sometimes projected on the cirrus, and sometimes on what was apparently clear sky. A photograph taken at 12 hours and 10 minutes, central standard time, looking directly south from the roof of the observatory with a 4″ x 5″ camera, a color filter and an isochromatic plate, shows the cloud formation, also a horizontal streak where a strip of rainbow colors occurred, and also a brilliant patch of iridescent or iris cloud. The above phenomenon was observed by eight others of the observatory staff and the writer (i. e., Messrs. Frost, Burnham, Barnard, Parkhurst, Barrett, Lee, Mitchell, and Slocum), no one of whom had before seen similar effects.

NOTE.—Those were the days when Halley's comet was being anxiously expected to pass near the earth, and the sky was being carefully scrutinized owing to the possibility that some unusual terrestrial phenomenon might occur. As a result of this careful scrutiny it is generally believed that nothing unusual occurred in the atmosphere of the earth, and we must therefore consider the patches and streaks of brilliant colors seen at Williams Bay to be fragments of ordinary solar halos due to the presence of ice crystals or snow in the cirrus formations back of and higher than the cumulus clouds. A complete description of all forms of halos is given in the Meteorologische Optike of Pernter and Exner, published at Vienna during the years 1902–1910, in memory of the first 50 years of activity of the K. K. Central Institute for Meteorology and Terrestrial Magnetism. The colored patches observed by Mr. Slocum seem to correspond closely with the location of the circular halo of about 22° radius that surrounds the sun, and is due to the presence of small prismatic crystals of ice. On page 312, Pernter says the parhelion of 22° distance from the sun is explained by the direct passage of solar rays through vertical ice prisms whose refracting angle is 60°, and whose refracting edges are perpendicular to the observer's horizon as they float in the atmosphere. On page 320, Pernter says the parhelion, therefore, differs from the halo of 20° in the fact that the latter being a closed ring around the sun is due to such prisms of ice as have every possible orientation . . . The measurements of the distance of the ring from the sun confirms this conclusion to the minutest details.

METEOROLOGY IN THE FAR EAST.

(Extract from the Scientific American of February 15, 1913.)

At the suggestion of Prof. Nakamura, in charge of the meteorological service of Japan, there will soon be held a meeting of the directors of meteorological observatories in the Far East, the first assembly of its kind. Practical meteorology has made great progress in that part of the world in recent years. Notable steps have been the extension of the Philippine Weather Bureau to outlying islands favorably situated for keeping track of typhoons; the organization of a complete meteorological service in Indo-China; the establishment of a telegraphic weather service along the whole China coast, and to a rapidly growing extent, in the interior of China, under the Zikawei Observatory, at Shanghai; the creation by the Germans of a local service for Kiao-chau, with headquarters at Tsingtao; and the organization of an excellent service in Korea, under Japanese auspices. It is understood that China intends to establish a national weather service, with headquarters at Peking, but no details of this plan are yet known. P. C. D.

TO OBSERVERS OF METEORS.

Shooting stars, meteors, bolides, and aerolites are but different names for large and small bits of matter that enter the earth's atmosphere and are frequently burned up in it, but occasionally they pass through it, going onward in space, while at other times they burst in pieces and fall to the earth. The largest aerolite known is the great mass of iron weighing 36 or 37 tons that was brought from Greenland to New York City by Peary, and is now deposited at the entrance to the American Museum of Natural History in that city. Observation of these bodies has some interest to astronomers, but an especial interest to meteorologists. The combination of several accurate observations of positions as seen from as many different stations enables an expert to calculate the precise path of the aerolite through the atmosphere. From this we detemine at once the altitude above the earth's surface at which there is sufficient air to heat the meteor to visibility. We can also calculate the resistance of the atmosphere at that elevation whence there results some knowledge of its density. There are numerous other important questions to be answered, and such observations may give us a clue as to the condition of the highest portion of our atmosphere. Doubtless the time will come when observations of bright shooting stars will be expected of every meteorological observer, but at present they are recorded by the few enthusiasts devoted to research in untrodden fields.

We are therefore pleased to know that Prof. Charles P. Olivier, of Agnes Scott College, Decatur, Ga., has taken up this class of work, in which Prof. H. A. Newton of Yale College won such distinction and aroused both astronomers and meteorologists to realize their great importance. Prof. Olivier has in fact organized "The American Meteor Society," "having become convinced that the time had come for further cooperation." Within a few months 15 faithful observers were enrolled, and over 1,400 meteors reported from California, Virginia, Tennessee, and Georgia. He desires to extend a hearty invitation to all who are interested in this subject, either because of its astronomical or its meteorological importance, and we hope that many will respond. Those whose business takes them out of doors during the nighttime can be especially useful. C. A.